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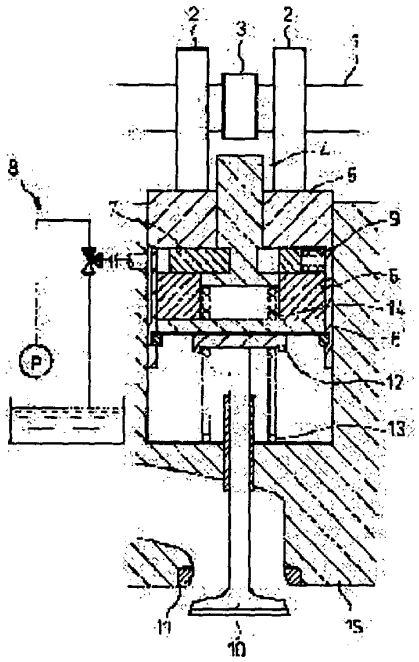
(71)Applicant : TOYOTA MOTOR CORP
(72)Inventor : NAGAE MASAHIRO

(54) VALVE DRIVING MECHANISM

(57)Abstract:
PROBLEM TO BE SOLVED: To control the quantity of internal EGR gas supplied to the combustion chamber.
SOLUTION: A second cam 3 and a valve 10 are switched so as to be driven- connected to each other or not. When the second cam 3 and an exhaust valve 10 are driven-connected, the exhaust valve 10 is opened during the intake stroke, and burnt gas is supplied from the engine-exhaust passage to the combustion chamber as the internal EGR gas. On the other hand, when the second can 3 and the exhaust valve 10 are not driven-connected, the exhaust valve 10 is closed during the intake stroke, and the internal EGR gas is not supplied from the engine-exhaust passage to the combustion chamber. The second cam 3 and the intake valve 10 are driven-connected, the intake valve 10 is opened during the exhaust stroke, and burnt gas is supplied from the engine-intake passage into the combustion chamber during the next intake stroke. When the second cam 3 and the intake valve 10 are not driven-connected, the intake valve 10 is closed, and the internal EGR gas is not supplied from the engine- exhaust passage to the combustion chamber during the next intake stroke.



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* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] The first cam nose for making a valve open in the first distance. The second cam nose for making a valve open in the second different distance from the first distance of the above. Are the valve drive equipped with the above and the first cam nose of the above is formed in the first cam. The second cam nose of the above is formed in the second cam, and the means for switching which can switch whether drive connection to the second cam of the above and the aforementioned valve is performed are provided. When drive connection of the second cam of the above and the aforementioned valve is carried out, the aforementioned valve is opened in the distance of the above second, and when drive connection of the second cam of the above and the aforementioned valve is not carried out, it is characterized by closing the aforementioned valve in the distance of the above second.
[Claim 2] The valve drive according to claim 1 characterized by the aforementioned valve being an exhaust valve.
[Claim 3] The second distance of the above is a valve drive according to claim 2 with which the first distance of the above is a distance in which a burnt gas includes the distance discharged outside a combustion chamber, and it is characterized by being a part of distance in which inhalation air is inhaled by the combustion chamber.
[Claim 4] The valve drive according to claim 1 characterized by the aforementioned valve being an inlet valve.
[Claim 5] The second distance of the above is a valve drive according to claim 4 with which the first distance of the above is a distance in which inhalation air includes the distance inhaled by the combustion chamber, and it is characterized by being a part of distance by which a burnt gas is discharged outside a combustion chamber.
[Claim 6] The second cam of the above is a valve drive according to claim 1 with which the first cam of the above is a high cam with the large amount of the maximum valve lifts, and it is characterized by being a low cam with the amount of the maximum valve lifts smaller than the amount of the maximum valve lifts of the first cam of the above.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to a valve drive.
[0002]
[Description of the Prior Art] The valve drive possessing the first cam nose for making an exhaust valve open conventionally in the distance (for it to say "like an exhaust air line" below) by which a burnt gas is discharged outside a combustion chamber, and the second cam nose for making an exhaust valve open in the distance (henceforth a "intake stroke") in which inhalation air is inhaled by the combustion chamber is known. According to this valve drive, NOx which a burnt gas is supplied through an exhaust valve at a combustion chamber as internal-EGR gas into an intake stroke, consequently is discharged from an internal combustion engine is made to decrease by making an exhaust valve open in an intake stroke. As an example of this kind of valve drive, there are some which were indicated by JP,1-136666,U, for example.
[0003] The shaft-orientations partial cross-section side elevation of the cam for an exhaust valve drive of the former [drawing 13] and drawing 14 are the valve-opening property views of the exhaust valve driven by the cam shown in drawing 13 . In drawing 13 , the second cam nose for the first cam nose for the cam for an exhaust valve drive and 101 opening a cam shaft to inside, and 100 making an exhaust valve, as for 102, open to it like an engine exhaust air line and 103 making an exhaust valve open in an intake stroke and 104 are cam base circles. It is formed in the cam 100 with the first single cam nose 102 and second cam nose 103 as shown in drawing 13 . Therefore, as shown in drawing 14 , the exhaust valve driven by the conventional cam 100 for an exhaust valve drive is not only set and opened like an exhaust air line, but is opened in an intake stroke.
[0004]
[Problem(s) to be Solved by the Invention] However, with the conventional valve drive, as mentioned above, since two cam noses 102 and 103 are formed in the single cam 100 for an exhaust valve drive, an exhaust valve will surely be opened in an intake stroke. Consequently, internal-EGR gas will always be supplied into an intake stroke at a combustion chamber also under the engine service condition which does not need to supply a burnt gas (henceforth "internal-EGR gas") through an exhaust valve at a combustion chamber from an engine flueway into an intake stroke.
[0005] In view of the aforementioned trouble, this invention aims at offering the valve drive which can adjust the internal-EGR capacity supplied to a combustion chamber by switching whether an exhaust valve is opened in an intake stroke.
[0006] Furthermore, this invention aims at offering the valve drive which can adjust the internal-EGR capacity supplied to a combustion chamber by switching whether an inlet valve is opened to inside like an exhaust air line.
[0007]
[Means for Solving the Problem] In the valve drive which possesses the first cam nose for making a valve open in the first distance, and the second cam nose for making a valve open in the second different distance from the first distance of the above according to invention according to claim 1 The first cam nose of the above is formed in the first cam, and the second cam nose of the above is formed in the second cam. The means for switching which can switch whether drive connection to the second cam of the above and the aforementioned valve is performed are provided. When drive connection of the second cam of the above and the aforementioned valve is carried out, the aforementioned valve is opened in the distance of the above second, and when drive connection of the second cam of the above and the aforementioned valve is not carried out, the valve drive characterized by closing the aforementioned valve is offered into the distance of the above second.
[0008] According to invention according to claim 2, the valve drive according to claim 1 characterized by the aforementioned valve being an exhaust valve is offered.

[0009] According to invention according to claim 3, the first distance of the above is a distance in which a burnt gas includes the distance discharged outside a combustion chamber, and the valve drive according to claim 2 characterized by the second distance of the above being a part of distance in which inhalation air is inhaled by the combustion chamber is offered.

[0010] When drive connection of the second cam and valve is carried out by enabling the change of whether drive connection to the second cam and a valve is performed in a valve drive according to claim 1 to 3 For example, when an exhaust valve is opened in a part of intake stroke by which inhalation air is inhaled by the combustion chamber and drive connection of the second cam and valve is not carried out, an exhaust valve is closed in a part of intake stroke by which for example, inhalation air is inhaled by the combustion chamber. If the exhaust valve is opened in a part of intake stroke, a burnt gas will be supplied to a combustion chamber as internal-EGR gas from an engine flueway, and on the other hand, if the exhaust valve is closed in a part of intake stroke, internal-EGR gas will not be supplied to a combustion chamber from an engine flueway. The internal-EGR capacity supplied to a combustion chamber according to the result, for example, an engine service condition etc., can be adjusted.

[0011] According to invention according to claim 4, the valve drive according to claim 1 characterized by the aforementioned valve being an inlet valve is offered.

[0012] According to invention according to claim 5, the first distance of the above is a distance in which inhalation air includes the distance inhaled by the combustion chamber, and the valve drive according to claim 4 characterized by the second distance of the above being a part of distance by which a burnt gas is discharged outside a combustion chamber is offered.

[0013] In a valve drive given in claims 4 and 5, when drive connection of the second cam and valve is carried out by enabling the change of whether drive connection to the second cam and a valve is performed For example, when an inlet valve is opened [like / a part of / the exhaust air line by which a burnt gas is discharged outside a combustion chamber] and drive connection of the second cam and valve is not carried out, an inlet valve is closed [like / a part of / the exhaust air line by which a burnt gas is discharged outside a combustion chamber]. If the inlet valve is opened [like / a part of / an exhaust air line], a burnt gas will be discharged in an engine inhalation-of-air path from a combustion chamber, and, subsequently the burnt gas will be supplied to a combustion chamber as internal-EGR gas from an engine inhalation-of-air path in the following intake stroke. On the other hand, if the inlet valve is closed [like / a part of / an exhaust air line], a burnt gas will not be discharged in an engine inhalation-of-air path from a combustion chamber, and, so, internal-EGR gas will not be supplied to a combustion chamber from an engine inhalation-of-air path in the following intake stroke. The internal-EGR capacity supplied to a combustion chamber according to the result, for example, an engine service condition etc., can be adjusted.

[0014] According to invention according to claim 6, the first cam of the above is a high cam with the large amount of the maximum valve lifts, and the valve drive according to claim 1 characterized by the second cam of the above being a low cam with the amount of the maximum valve lifts smaller than the amount of the maximum valve lifts of the first cam of the above is offered.

[0015] Since the amount of the maximum valve lifts of the second cam which affects the internal-EGR capacity supplied to a combustion chamber in a valve drive according to claim 6 is made smaller than the amount of the maximum valve lifts of the first cam which affects the inhalation air content inhaled by the amount of burnt gases or combustion chamber discharged outside a combustion chamber, it is avoidable that the internal-EGR capacity supplied to a combustion chamber becomes superfluous.

[0016]

[Embodiments of the Invention] Hereafter, the operation gestalt of this invention is explained using an accompanying drawing.

[0017] The outline block diagram of the first operation gestalt of the valve drive of this invention when drive connection of a low cam and the exhaust valve is carried out and the exhaust valve is made to open drawing 1 by the cam nose of a high cam, The outline block diagram of this operation gestalt when drive connection of a low cam and the exhaust valve is carried out and the exhaust valve is made to open drawing 2 by the cam nose of a low cam, The outline block diagram of this operation gestalt when drive connection of the second cam and exhaust valve is not carried out and the exhaust valve is made to open drawing 3 by the cam nose of a high cam, Drawing 4 is the outline block diagram of this operation gestalt when the exhaust valve is made to close the valve, when drive connection of the second cam and exhaust valve is not carried out.

[0018] drawing 1 - drawing 4 -- setting -- 1 -- the cam shaft for an exhaust valve drive, and 2 -- a nose -- a high cam with the large amount of the maximum valve lifts with high height, and 3 -- a nose -- it is a low cam with the small amount of the maximum valve lifts with low height Outer lifter [for the inner lifter for 4 contacting the low cam 3 and 5 contacting the high cam 2], 6, and 6' is the inner body which forms some outer lifters 5. The hydraulic-pressure-

supply equipment for the plate for connection for 7 connecting the inner lifter 4 and the outer lifter 5 and 8 energizing the plate 7 for connection to the side which connects the inner lifter 4 and the outer lifter 5, and 9 are the springs for separation for energizing the plate 7 for connection to the side which separates the inner lifter 4 and the outer lifter 5. The valve seat [exhaust valve] to which 10 contacts and, as for 11, an exhaust valve 10 contacts during the valve closing, the retainer by which 12 was attached in the cam side edge of an exhaust valve 10, and 13 are valve springs arranged between a retainer 12 and the cylinder head 15, in order to energize an exhaust valve 10 to a valve-opening side. 14 is a lifter spring which energizes the inner lifter 4 to the low cam 3 side, in order to position the inner lifter 4 to the outer lifter 5 in the position which can be connected.

[0019] As shown in drawing 1 - drawing 4 , drive connection of the low cam 3 and the exhaust valve 10 may be carried out through the inner lifter 4, the inner body 6, and 6' and a retainer 12 by the plate 7 for connection, and hydraulic-pressure-supply equipment 8. As shown in drawing 1 and drawing 2 in detail, when the plate 7 for connection is energized at the side which oil pressure is supplied by hydraulic-pressure-supply equipment 8, and connects the inner lifter 4 and the outer lifter 5, drive connection of the low cam 3 and the exhaust valve 10 is carried out. On the other hand, as shown in drawing 3 and drawing 4 , when the plate 7 for connection is energized at the side which oil pressure is not supplied by hydraulic-pressure-supply equipment 8, but separates the inner lifter 4 and the outer lifter 5, drive connection of the low cam 3 and the exhaust valve 10 is not carried out.

[0020] It is a time of drive connection of the low cam 3 and the exhaust valve 10 being carried out, and when the cam nose of the high cam 2 is in contact with the outer lifter 5, an exhaust valve 10 is made to open through the outer lifter 5, the plate 7 for connection, and the inner body 6 and 6', as shown in drawing 1 by the cam nose of the high cam 2. It is a time of drive connection of the low cam 3 and the exhaust valve 10 being carried out, and when the cam nose of the low cam 3 is in contact with the inner lifter 4, an exhaust valve 10 is made to open through the inner lifter 4, the plate 7 for connection, and the inner body 6 and 6', as shown in drawing 2 by the cam nose of the low cam 3. It is a time of drive connection of the low cam 3 and the exhaust valve 10 not being carried out, and when the cam nose of the high cam 2 is in contact with the outer lifter 5, an exhaust valve 10 is made to open through the outer lifter 5, the plate 7 for connection, and the inner body 6 and 6', as shown in drawing 3 by the cam nose of the high cam 2. Even if it was a time of the cam nose of the low cam 3 being in contact with the inner lifter 4, when drive connection of the low cam 3 and the exhaust valve 10 is not carried out, as shown in drawing 4 , an exhaust valve 10 is not made to open and has been closed.

[0021] It is the graph which compared the time of drive connection of drawing 5 not being carried out with the time of drive connection of the low cam 3 and the exhaust valve 10 being carried out, and showed the relation between the degree of crank angle, and the amount of valve lifts. Drawing 5 (a) is the graph which showed the relation between the degree of crank angle when drive connection of the low cam 3 and the exhaust valve 10 is carried out, and the amount of valve lifts in detail. Drawing 5 (b) is the graph which showed the relation between the degree of crank angle when drive connection of the low cam 3 and the exhaust valve 10 is carried out, and the amount of valve lifts. Drawing 6 is the partial cross-section side elevation of a cam shaft 1, the low cam 2, and the high cam 3. In drawing 5 and drawing 6 , the cam nose of a high cam [23], the base circle of a high cam [24], the cam nose of a low cam [33], the base circle of a low cam [34], the amount of the maximum valve lifts of a high cam [1 / L], and L2 are the amounts of the maximum valve lifts of a low cam. The first distance I means the distance an exhaust valve 10 is made to open by the cam nose 23 or the cam nose 33 of a low cam of a high cam, and means the distance an exhaust valve 10 may be made to open by only the cam nose 33 of a low cam in the second distance II.

[0022] As shown in drawing 5 (a), when drive connection of the low cam 3 and the exhaust valve 10 is carried out, an exhaust valve 10 is made to open in the first distance I by the cam nose 23 of a high cam. In detail, a burnt gas is discharged for the first distance I by the engine flueway from a combustion chamber from a start point in time before a top dead center TDC, and a burnt gas is supplied to a combustion chamber as internal-EGR gas from an engine flueway between a top dead center TDC and the end time of the first distance I. The state of the valve drive shown in drawing 1 corresponds to the degree T1 of crank angle. Subsequently, an exhaust valve 10 is made to open in the second distance II by the cam nose 33 of a low cam. Also in the second distance II, a burnt gas is supplied to a combustion chamber as internal-EGR gas from an engine flueway. The state of the valve drive shown in drawing 2 corresponds to the degree T2 of crank angle. In addition, when the burnt gas is supplied to the combustion chamber as internal-EGR gas from the engine flueway in the second distance II, the inlet valve (not shown) is opened in order to make a combustion chamber inhale inhalation air. That is, in the second distance II, while internal-EGR gas is supplied through an exhaust valve 10, inhalation air is supplied to a combustion chamber through an inlet valve (not shown).

[0023] On the other hand, as shown in drawing 5 (b), when drive connection of the low cam 3 and the exhaust valve 10 is not carried out, an exhaust valve 10 is made to open in the first distance I like the case where it is shown in drawing 5 (a) by the cam nose 23 of a high cam. In detail, a burnt gas is discharged for the first distance I by the engine flueway

from a combustion chamber from a start point in time before a top dead center TDC, and a burnt gas is supplied to a combustion chamber as internal-EGR gas from an engine flueway between a top dead center TDC and the end time of the first distance I. The state of the valve drive shown in drawing 3 corresponds to the degree T3 of crank angle. Subsequently, unlike the case where it is shown in drawing 5 (a), an exhaust valve 10 is closed in the second distance II. Therefore, a burnt gas is not supplied to a combustion chamber as internal-EGR gas from an engine flueway. The state of the valve drive shown in drawing 4 corresponds to the degree T4 of crank angle. In addition, among the second distance II, the inlet valve (not shown) is opened in order to make a combustion chamber inhale inhalation air. That is, in the second distance II, through an exhaust valve 10, internal-EGR gas is not supplied to a combustion chamber, but only inhalation air is supplied to it through an inlet valve (not shown).

[0024] When drive connection of the low cam 3 and the exhaust valve 10 is carried out by enabling the change of whether drive connection to the low cam 3 and an exhaust valve 10 is performed according to this operation form, an exhaust valve 10 is opened in the second distance II whose inhalation air is a part of intake stroke inhaled by the combustion chamber as shown in drawing 5 (a). On the other hand, when drive connection of the low cam 3 and the exhaust valve 10 is not carried out, an exhaust valve 10 is closed in the second distance II whose inhalation air is a part of intake stroke inhaled by the combustion chamber as shown in drawing 5 (b). If the exhaust valve 10 is opened in a part of intake stroke, a burnt gas will be supplied to a combustion chamber as internal-EGR gas from an engine flueway, and on the other hand, if the exhaust valve 10 is closed in a part of intake stroke, internal-EGR gas will not be supplied to a combustion chamber from an engine flueway.

[0025] Consequently, it becomes possible by switching whether drive connection to the low cam 3 and an exhaust valve 10 is performed to adjust the internal-EGR capacity supplied to a combustion chamber for example, according to an engine service condition etc. By supplying internal-EGR gas to a combustion chamber appropriately from an engine flueway, while raising emission, mpg can be raised. Moreover, since an exhaust pressure becomes high when a supercharger is formed, it becomes easy to supply internal-EGR gas to a combustion chamber.

[0026] Moreover, since the amount L2 of the maximum valve lifts of the low cam 3 which affects the internal-EGR capacity supplied to a combustion chamber from an engine flueway is made smaller than the amount L1 of the maximum valve lifts of the high cam 2 which affects the amount of burnt gases discharged by the engine flueway from a combustion chamber according to this operation form, it is avoidable that the internal-EGR capacity supplied to a combustion chamber becomes superfluous.

[0027] In addition, although the plate 7 for connection consists of these operation forms so that the inner lifter 4 and the outer lifter 5 may be connected when oil pressure is supplied from hydraulic-pressure-supply equipment 8, it is also possible to constitute the plate for connection from other operation forms so that an inner lifter and an outer lifter may be connected, when supply of the oil pressure from hydraulic-pressure-supply equipment is intercepted.

[0028] Hereafter, the second operation form of the valve drive of this invention is explained. This operation form is different from the first operation form only in that the phase of the cam nose of a low cam to a high cam differs from the thing of the first operation form.

[0029] It is the graph which compared the time of drive connection of drawing 7 not being carried out with the time of drive connection of the low cam 3 and the exhaust valve 10 being carried out, and showed the relation between the degree of crank angle, and the amount of valve lifts. Drawing 7 (a) is the graph which showed the relation between the degree of crank angle when drive connection of the low cam 3 and the exhaust valve 10 is carried out, and the amount of valve lifts in detail. Drawing 7 (b) is the graph which showed the relation between the degree of crank angle when drive connection of the low cam 3 and the exhaust valve 10 is carried out, and the amount of valve lifts. Drawing 8 is the partial cross-section side elevation of a cam shaft 1, the low cam 2, and the high cam 3. As shown in drawing 7 and drawing 8 , in the valve drive of this operation form, rather than the case of the first operation form shown in drawing 6 , the cam nose 23 of a high cam and the cam nose 33 of a low cam approach the hand of cut of a cam shaft, and are arranged. Therefore, the first Distance I and second distance II are close from the case of the first operation form shown in drawing 5 .

[0030] Thus, it becomes possible to perform stratification combustion appropriately changing the timing of the second distance II, i.e., by changing the timing by which internal-EGR gas is supplied to a combustion chamber.

[0031] Hereafter, the third operation form of the valve drive of this invention is explained. This operation form is different from the first operation form only in that this invention is applied to the inlet valve instead of an exhaust valve. That is, in drawing 1 - drawing 4 , the valve seat [inlet valve] to which the cam shaft for an inlet-valve drive and 10 contact, and, as for 11, an inlet valve 10 contacts during the valve closing in 1, the retainer by which 12 was attached in the cam side edge of an inlet valve 10, and 13 are valve springs arranged between a retainer 12 and the cylinder head 15, in order to energize an inlet valve 10 to a valve-opening side.

[0032] As shown in drawing 1 - drawing 4 , drive connection of the low cam 3 and the inlet valve 10 may be carried

out through the inner lifter 4, the inner body 6, and 6' and a retainer 12 by the plate 7 for connection, and hydraulic-pressure-supply equipment 8. As shown in drawing 1 and drawing 2 in detail, when the plate 7 for connection is energized at the side which oil pressure is supplied by hydraulic-pressure-supply equipment 8, and connects the inner lifter 4 and the outer lifter 5, drive connection of the low cam 3 and the inlet valve 10 is carried out. On the other hand, as shown in drawing 3 and drawing 4 , when the plate 7 for connection is energized at the side which oil pressure is not supplied by hydraulic-pressure-supply equipment 8, but separates the inner lifter 4 and the outer lifter 5, drive connection of the low cam 3 and the inlet valve 10 is not carried out.

[0033] It is a time of drive connection of the low cam 3 and the inlet valve 10 being carried out, and when the cam nose of the high cam 2 is in contact with the outer lifter 5, an inlet valve 10 is made to open through the outer lifter 5, the plate 7 for connection, and the inner body 6 and 6', as shown in drawing 1 by the cam nose of the high cam 2. It is a time of drive connection of the low cam 3 and the inlet valve 10 being carried out, and when the cam nose of the low cam 3 is in contact with the inner lifter 4, an inlet valve 10 is made to open through the inner lifter 4, the plate 7 for connection, and the inner body 6 and 6', as shown in drawing 2 by the cam nose of the low cam 3. It is a time of drive connection of the low cam 3 and the inlet valve 10 not being carried out, and when the cam nose of the high cam 2 is in contact with the outer lifter 5, an inlet valve 10 is made to open through the outer lifter 5, the plate 7 for connection, and the inner body 6 and 6', as shown in drawing 3 by the cam nose of the high cam 2. Even if it was a time of the cam nose of the low cam 3 being in contact with the inner lifter 4, when drive connection of the low cam 3 and the inlet valve 10 is not carried out, as shown in drawing 4 , an inlet valve 10 is not made to open and has been closed.

[0034] It is the graph which compared the time of drive connection of drawing 9 not being carried out with the time of drive connection of the low cam 3 and the inlet valve 10 being carried out, and showed the relation between the degree of crank angle, and the amount of valve lifts. Drawing 9 (a) is the graph which showed the relation between the degree of crank angle when drive connection of the low cam 3 and the inlet valve 10 is carried out, and the amount of valve lifts in detail. Drawing 9 (b) is the graph which showed the relation between the degree of crank angle when drive connection of the low cam 3 and the inlet valve 10 is carried out, and the amount of valve lifts. Drawing 10 is the partial cross-section side elevation of a cam shaft 1, the low cam 2, and the high cam 3. In drawing 9 and drawing 10 , the cam nose of a high cam [23], the base circle of a high cam [24], the cam nose of a low cam [33], the base circle of a low cam [34], the amount of the maximum valve lifts of a high cam [1 / L], and L2 are the amounts of the maximum valve lifts of a low cam. The first distance I means the distance an inlet valve 10 is made to open by the cam nose 23 or the cam nose 33 of a low cam of a high cam, and means the distance an inlet valve 10 may be made to open by only the cam nose 33 of a low cam in the second distance II.

[0035] As shown in drawing 9 (a), when drive connection of the low cam 3 and the inlet valve 10 is carried out, an inlet valve 10 is made to open in the second distance II by the cam nose 33 of a low cam. In detail, a burnt gas is discharged by the engine inhalation-of-air path from a combustion chamber. The state of the valve drive shown in drawing 2 corresponds to the degree T5 of crank angle. In addition, when the burnt gas is discharged by the engine inhalation-of-air path from the combustion chamber in the second distance II, the exhaust valve (not shown) is opened in order to make an engine flueway discharge a burnt gas. Subsequently, an inlet valve 10 is made to open in the first distance I by the cam nose 23 of a high cam. In detail, a burnt gas is discharged by the engine inhalation-of-air path from a combustion chamber from the start point in time of the first distance I before a top dead center TDC, and the burnt gas and inhalation air as internal-EGR gas are supplied to a combustion chamber from an engine inhalation-of-air path between a top dead center TDC and the end time of the first distance I. The state of the valve drive shown in drawing 1 corresponds to the degree T6 of crank angle.

[0036] On the other hand, as shown in drawing 9 (b), when drive connection of the low cam 3 and the exhaust valve 10 is not carried out, unlike the case where it is shown in drawing 9 (a), an inlet valve 10 is closed in the second distance II. Therefore, a burnt gas is not discharged by the engine inhalation-of-air path from a combustion chamber. The state of the valve drive shown in drawing 4 corresponds to the degree T7 of crank angle. In addition, among the second distance II, the exhaust valve (not shown) is opened in order to make an engine flueway discharge a burnt gas. That is, in the second distance II, a burnt gas is not discharged by the engine inhalation-of-air path through an inlet valve 10, but is discharged by only the engine flueway through an exhaust valve (not shown). Subsequently, an inlet valve 10 is made to open in the first distance I like the case where it is shown in drawing 9 (a) by the cam nose 23 of a high cam. In detail, a burnt gas is discharged by the engine inhalation-of-air path from a combustion chamber from the start point in time of the first distance I before a top dead center TDC, and the burnt gas and inhalation air as internal-EGR gas are supplied to a combustion chamber from an engine inhalation-of-air path between a top dead center TDC and the end time of the first distance I. The state of the valve drive shown in drawing 3 corresponds to the degree T8 of crank angle.

[0037] When drive connection of the low cam 3 and the inlet valve 10 is carried out by enabling the change of whether

drive connection to the low cam 3 and an inlet valve 10 is performed according to this operation form, an inlet valve 10 is opened in the second distance II which it is like [a part of] the exhaust air line by which a burnt gas is discharged from a combustion chamber as shown in drawing 9 (a). On the other hand, when drive connection of the low cam 3 and the inlet valve 10 is not carried out, an inlet valve 10 is closed in the second distance II which it is like [a part of] the exhaust air line by which a burnt gas is discharged from a combustion chamber as shown in drawing 9 (b). If the inlet valve 10 is opened in the second distance II which it is like [a part of] an exhaust air line, a burnt gas will be discharged by the engine inhalation-of-air path from a combustion chamber, and on the other hand, if the inlet valve 10 is closed in the second distance II which it is like [a part of] an exhaust air line, a burnt gas will not be discharged by the engine inhalation-of-air path from a combustion chamber.

[0038] Consequently, it becomes possible by switching whether drive connection to the low cam 3 and an inlet valve 10 is performed to adjust the amount of the burnt gas as internal-EGR gas which is got blocked and supplied to a combustion chamber from an engine inhalation-of-air path in the following intake stroke which adjusts the amount of burnt gases which sets like an exhaust air line for example, according to an engine service condition etc., and is discharged by the engine inhalation-of-air path from a combustion chamber. By supplying internal-EGR gas to a combustion chamber appropriately from an engine inhalation-of-air path, while raising emission, mpg can be raised.

[0039] Moreover, the amount L2 of the maximum valve lifts of the low cam 3 which affects the amount of the burnt gas supplied to a combustion chamber as internal-EGR gas from an engine inhalation-of-air path after being discharged by the engine inhalation-of-air path from a combustion chamber according to this operation form Since it is made smaller than the amount L1 of the maximum valve lifts of the high cam 2 which affects the inhalation air content supplied to a combustion chamber from an engine flueway, it is avoidable that the internal-EGR capacity supplied to a combustion chamber becomes superfluous.

[0040] In addition, although the plate 7 for connection consists of these operation forms so that the inner lifter 4 and the outer lifter 5 may be connected when oil pressure is supplied from hydraulic-pressure-supply equipment 8, it is also possible to constitute the plate for connection from other operation forms so that an inner lifter and an outer lifter may be connected, when supply of the oil pressure from hydraulic-pressure-supply equipment is intercepted.

[0041] Hereafter, the fourth operation form of the valve drive of this invention is explained. This operation form is different from the third operation form only in that the phase of the cam nose of a low cam to a high cam differs from the thing of the third operation form.

[0042] It is the graph which compared the time of drive connection of drawing 11 not being carried out with the time of drive connection of the low cam 3 and the inlet valve 10 being carried out, and showed the relation between the degree of crank angle, and the amount of valve lifts. Drawing 11 (a) is the graph which showed the relation between the degree of crank angle when drive connection of the low cam 3 and the inlet valve 10 is carried out, and the amount of valve lifts in detail. Drawing 11 (b) is the graph which showed the relation between the degree of crank angle when drive connection of the low cam 3 and the inlet valve 10 is carried out, and the amount of valve lifts. Drawing 12 is the partial cross-section side elevation of a cam shaft 1, the low cam 2, and the high cam 3. As shown in drawing 11 and drawing 12 , in the valve drive of this operation form, rather than the case of the first operation form shown in drawing 10 , the cam nose 23 of a high cam and the cam nose 33 of a low cam approach the hand of cut of a cam shaft, and are arranged. Therefore, the first Distance I and second distance II are close from the case of the first operation form shown in drawing 9 .

[0043]

[Effect of the Invention] According to invention according to claim 1 to 5, the internal-EGR capacity supplied to a combustion chamber can be adjusted.

[0044] According to invention according to claim 6, it is avoidable that the internal-EGR capacity supplied to a combustion chamber becomes superfluous.

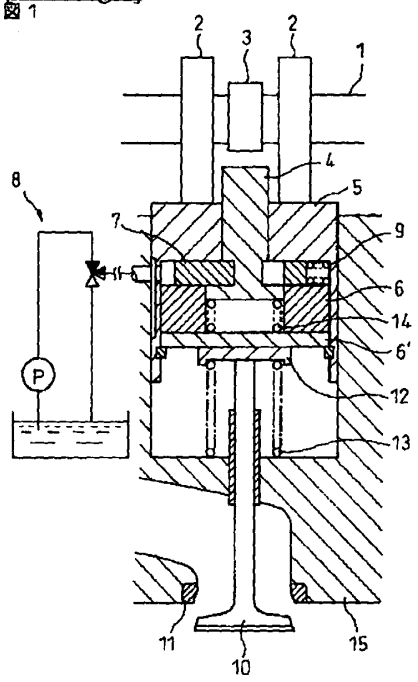
[Translation done.]

* NOTICES *

DRAWINGS

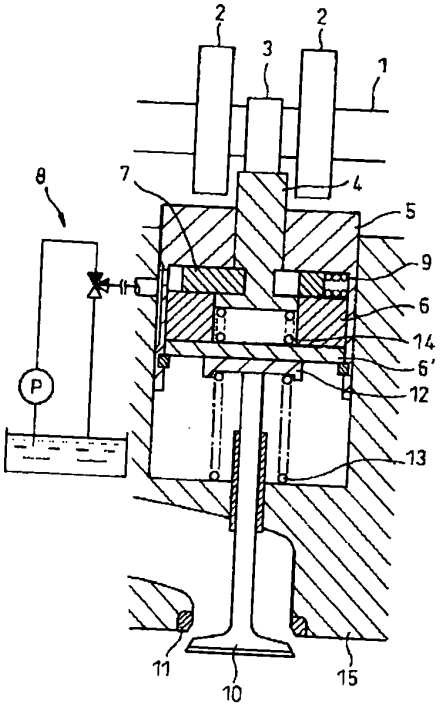
[Drawing 1]

図 1



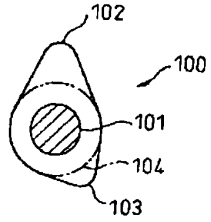
[Drawing 2]

図 2



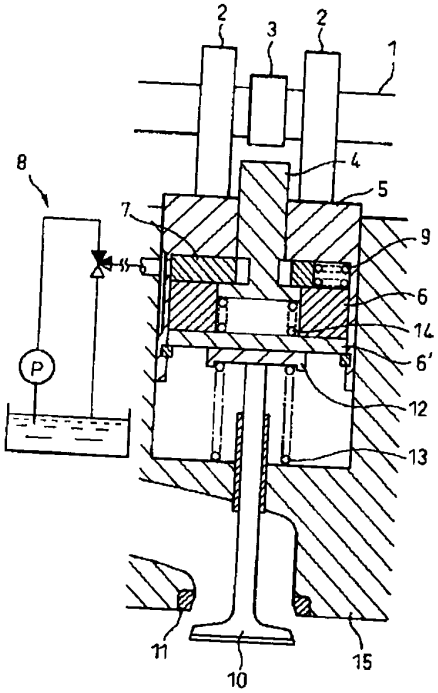
[Drawing 13]

図 13



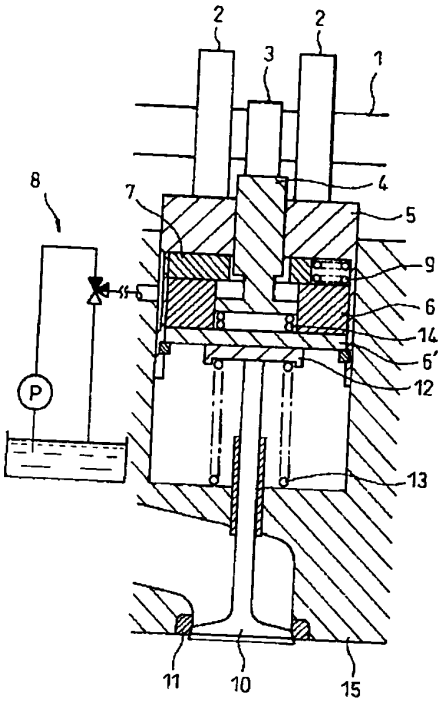
[Drawing 3]

図 3



[Drawing 4]

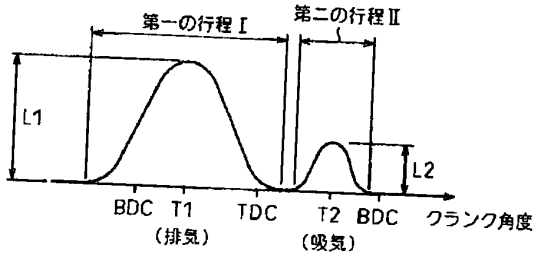
図 4



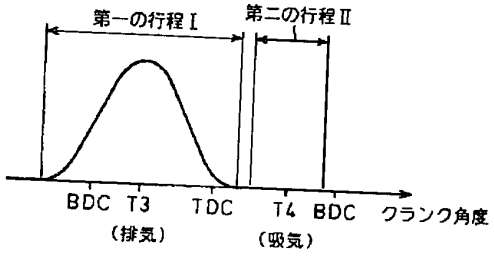
[Drawing 5]

図 5

(a)

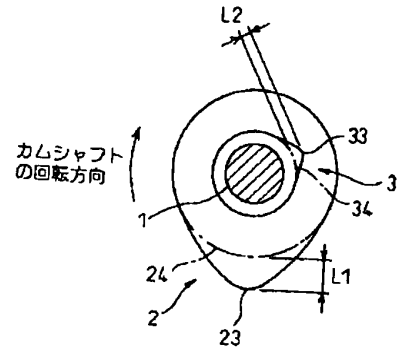


(b)



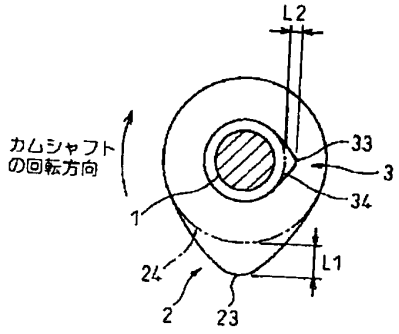
[Drawing 6]

図 6



[Drawing 8]

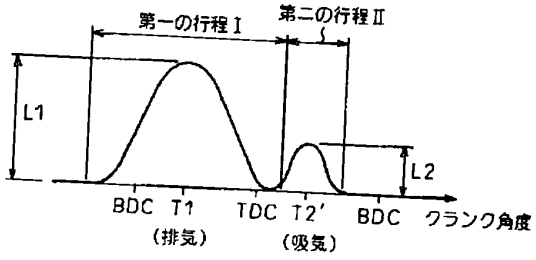
図 8



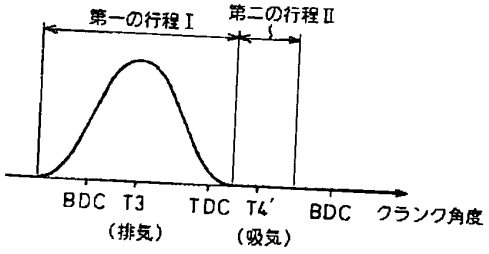
[Drawing 7]

図 7

(a)



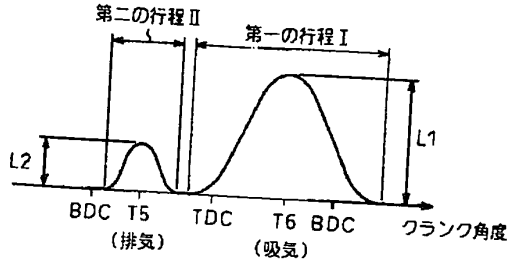
(b)



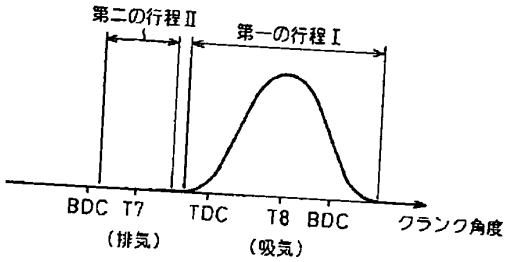
[Drawing 9]

図 9

(a)

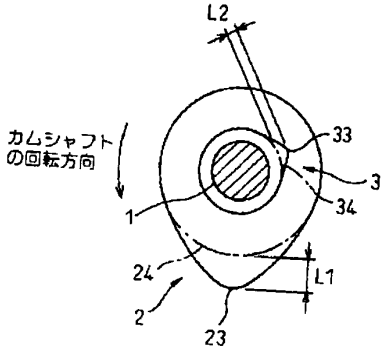


(b)



[Drawing 10]

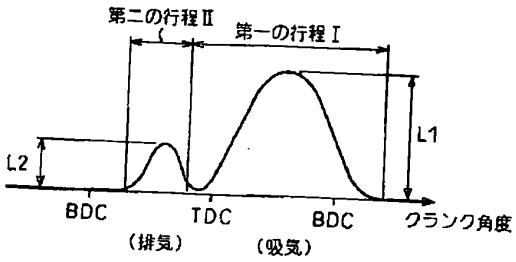
図 10



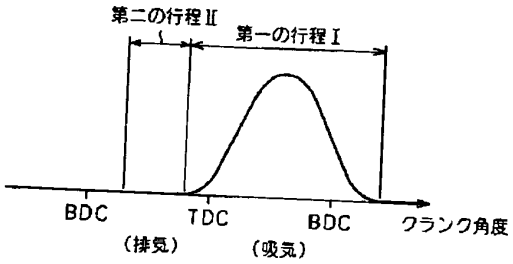
[Drawing 11]

図 11

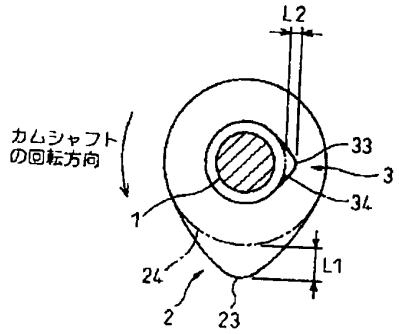
(a)



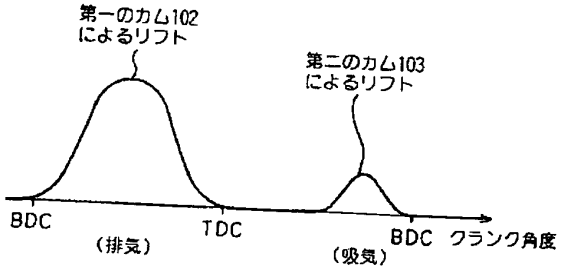
(b)



[Drawing 12]
図 12



[Drawing 14]
図 14



[Translation done.]